

TENT COOPERATION TRE/TY

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

ARCHER, Philip, B.
Urquhart-Dykes & Lord
New Priestgate House
57 Priestgate
Peterborough, Cambridgeshire, PE1
1JX
ROYAUME-UNI

Date of mailing (day/month/year) 13 March 2001 (13.03.01)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference GHS/5937/6	
International application No. PCT/GB99/03667	International filing date (day/month/year) 05 November 1999 (05.11.99)

1. The following indications appeared on record concerning:		
<input checked="" type="checkbox"/> the applicant	<input checked="" type="checkbox"/> the inventor	<input type="checkbox"/> the agent <input type="checkbox"/> the common representative
Name and Address CRONK, Peter 87 Craven Avenue St. Judes Plymouth PL4 8SW United Kingdom	State of Nationality GB	State of Residence GB
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:		
<input type="checkbox"/> the person	<input type="checkbox"/> the name	<input checked="" type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence
Name and Address CRONK, Peter 57 Craven Avenue St. Judes Plymouth PL4 8SW United Kingdom	State of Nationality GB	State of Residence GB
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	
3. Further observations, if necessary:		
4. A copy of this notification has been sent to:		
<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned	
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned	
<input type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:	

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Eugénia Santos Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

ARCHER, Philip, B.
Urquhart-Dykes & Lord
New Priestgate House
57 Priestgate
Peterborough, Cambridgeshire, PE1
1JX
ROYAUME-UNI

Date of mailing (day/month/year) 10 November 2000 (10.11.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference GHS/5937/6	
International application No. PCT/GB99/03667	International filing date (day/month/year) 05 November 1999 (05.11.99)

1. The following indications appeared on record concerning:

☐ the applicant ☐ the inventor ☒ the agent ☐ the common representative

Name and Address SMAGGASGALE, Gillian, Helen Olswang 90 Long Acre London WC2E 9TT United Kingdom	State of Nationality	State of Residence
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2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person ☐ the name ☐ the address ☐ the nationality ☐ the residence

Name and Address ARCHER, Philip, B. Urquhart-Dykes & Lord New Priestgate House 57 Priestgate Peterborough, Cambridgeshire, PE1 1JX United Kingdom	State of Nationality	State of Residence
	Telephone No. 44 1733 340011	
	Facsimile No. 44 1733 566387	
	Teleprinter No.	

3. Further observations, if necessary:

A power of attorney signed by CRONK, Peter is required.

4. A copy of this notification has been sent to:

☒ the receiving Office ☐ the designated Offices concerned
☐ the International Searching Authority ☒ the elected Offices concerned
☒ the International Preliminary Examining Authority ☐ other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer R. Chrem Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
 United States Patent and Trademark
 Office
 Box PCT
 Washington, D.C.20231
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 05 September 2000 (05.09.00)	Applicant's or agent's file reference GHS/5937/6
International application No. PCT/GB99/03667	Priority date (day/month/year) 06 November 1998 (06.11.98)
International filing date (day/month/year) 05 November 1999 (05.11.99)	
Applicant NESS, Derek et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

06 June 2000 (06.06.00)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

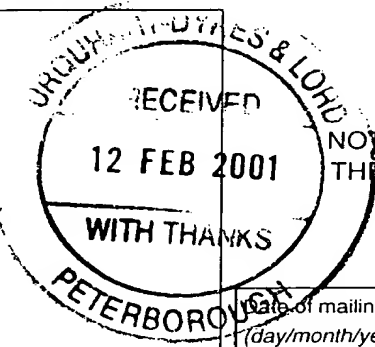
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Charlotte ENGER Telephone No.: (41-22) 338.83.38
--	--

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

PHILIP B. ARCHER
URQUHART-DYKES & LORD
New Priestgate House
57 Priestgate
PETERBOROUGH, CAMBS PE1 1JX
GRANDE BRETAGNE



PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing
(day/month/year)

07.02.2001

Applicant's or agent's file reference

GHS/5937/6

P 35013500

IMPORTANT NOTIFICATION

International application No.

PCT/GB99/03667

International filing date (day/month/year)

05/11/1999

Priority date (day/month/year)

06/11/1998

Applicant

STRUCTURAL POLYMER SYSTEMS LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

COPIED:- 100

NUMBER:- 263

CHECKED:- RHP RHP

Name and mailing address of the IPEA/



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
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Authorized officer

Ridé, M-C

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference GHS/5937/6	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) FOR FURTHER ACTION	
International application No. PCT/GB99/03667	International filing date (day/month/year) 05/11/1999	Priority date (day/month/year) 06/11/1998
International Patent Classification (IPC) or national classification and IPC B32B27/12		
Applicant STRUCTURAL POLYMER SYSTEMS LIMITED et al.		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 8 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input checked="" type="checkbox"/> Certain observations on the international application 		
Date of submission of the demand 06/06/2000	Date of completion of this report 07.02.2001	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Miller, B Telephone No. +49 89 2399 8540	



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB99/03667

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

Description, pages:

1-17 as received on 15/02/2000 with letter of 15/02/2000

Claims, No.:

1-21 as received on 15/02/2000 with letter of 15/02/2000

Drawings, sheets:

1/1 as received on 19/01/2000 with letter of 19/01/2000

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/03667

☐ the drawings, sheets:

5. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

see separate sheet

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-21

Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-21

Industrial applicability (IA)	Yes:	Claims	1-21
	No:	Claims	

2. Citations and explanations
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item I

Basis of the report

The amendments filed with the letter dated 06.11.2000 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT. The amendment concerned is the following:

"said moulding material further comprising an air transport structure for allowing entrapped air to pass out of the material during processing of the material" (claim 1).

The corresponding paragraph in the description (page 4, lines 22-24) as originally filed does not disclose a further **transport structure**, contrary to Article 34(2)(b) PCT. Said paragraph describes in a rather speculative way properties of the fibrous layer.

Besides, said amendment would not satisfy the requirements following from Article 6 PCT, since the amendment describes more or less only the desired result which merely amounts to a statement of the underlying problem without mentioning the technical features necessary for achieving this result.

Furthermore it seems that every fibrous layer known from the prior art could play the role of the air transport structure. Therefore the feature would not seem to be suitable to distinguish present claim 1 from the prior art, even if the amendment would meet the requirements of Article 34(2)(b) PCT.

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. The present application does not meet the requirements of Article 33(2) PCT, because the subject-matter of independent claim 1, 16, 18 and 20 is not novel. The moulding material, article of manufacture and the method of forming said material disclosed in the following documents come within the scope of said claims.

a) **DE 35 36 272 (D2)**

In the production of two-dimensionally extended fibre-composite laminate mouldings, to prevent local impregnation defects and the formation of voids, a preformed article is used for the moulding step. The preformed article comprises a resin layer and a not impregnated fibre layer (claim 4). In particular in Fig. 3b (D2) a laminate is shown (see also the corresponding paragraph in the description in col. 4, lines 29-42) which detracts from the novelty of present claims 1 and 16.

b) **EP-A-0 807 514 (D3)**

A method for preparing an uncured supported elastomer material includes the steps of: providing a layer of uncured elastomer material substantially adjacent to the fibrous reinforcement material; exposing the layer and the fibrous reinforcement to a temperature below a curing temperature and above a flow point of the uncured elastomer material, and a pressure sufficient that the uncured elastomer material flows into the fibrous reinforcement material, so as to provide an uncured supported elastomer material (claim 1, see also Fig. 1 and the corresponding paragraph in the description in col. 3, lines 41-46).

c) **US-A-3 790 432 (D4)**

The laminate is made up by stacking alternating layers of polyquinoxaline film and the fibreglass cloth. The laminated body, or gasket blank obtained from it, is covered over its entire surface with a heat-treated sheet or film of polyquinoxaline and subjected to high-temperature moulding (col. 3, lines 52-60).

d) **DE 32 43 925 (D5)**

A method of producing laminates from cross-linkable, thermoplastic polyethylene (PE), wherein a film of polymer material being pressed between glass fabrics (claim 1). The films are pressed to form a prepreg in two steps under pressure at temperatures from 150°C to 180°C (claim 5).

e) **US-A-5 431 995 (D7)**

In Fig. 1 and the corresponding pages of the description (col.4, lines 25-33) of document D7 a further laminate is presented comprising a layer of resin material and a fibrous layer conjoined to at least on surface of the resin layer.

Thereby the following remarks seem to be important:

- It is not excluded by present claim 1, that the multi layered product is partially preshaped. The requirement "preform" means in its broadest sense only, that the laminate is shaped after its manufacture in a further forming step.
- It is only a preferred embodiment, that the outer surface of the moulding material is free from resin (page 4, lines 12-14), whereas it stated in the present application that "the moulding material of the present invention may itself be a prepreg" (page 3, line 26, claim 15). Therefore all of the cited documents defining more or less conventional prepregs comprising a layer of resin material and conjoined to at least one surface thereof a fibrous layer detract from the novelty of said claims.

2. Dependent claims 2-15, 17, 19 and 21 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT with respect to novelty and inventive step. The described features are either known from the prior art or come within the scope of the customary practice followed by the man skilled in the art, especially as the advantages thus achieved can be readily contemplated in advance.

Re Item VIII

Certain observations on the international application

The particular use of the multilayered product mentioned in claim 16 is not suitable to render the subject-matter of claims to which claim 16 refers novel, because the multilayered materials described in documents D2-D5 and D7 are suitable for use in the production of a surface layer (PCT-Guidelines, III-4.8).

It has been suggested that interleaving dry reinforcement layers between the layers of the prepreg as the laminate is built up can reduce the problem of void formation. However, whilst this technique does go some way towards addressing the problem of void formation, the presence of the dry reinforcement layer reduces the relative resin content of the finished product which may have a detrimental effect on the strength of the finished product. Whilst it is possible to compensate for the loss of resin from the prepreg to the dry reinforcement layers by providing additional resin in the prepreg, such increased resin content materials are difficult to handle because of their high tack and low drape. It is also important that there is complete coincidence of the resin rich prepreg and dry layers throughout the laminate or resin rich or resin lean areas will result.

(1) <---> → see additional sheets 3A, 3B, 3C

We have now found that the aforementioned problems can be solved by the provision of a multi-layered moulding material comprising a layer of a resin material layer and conjoined to at least one surface thereof a fibrous layer.

Thus, according to a first aspect of the present invention, there is provided a multi-layered moulding material ~~comprising a layer of resin material and conjoined to at least one surface thereof a fibrous layer~~ <preform> *<according to any of the accompanying claims.>*

The fibrous layer may be attached to the resin layer by any suitable means. The fibrous layer may be held in place by the inherent tack of the surface of the resin layer or, in one alternative arrangement, the fibrous layer may be partially impregnated by the resin of the resin layer.

The moulding material of the present invention may itself be a prepreg.

In a particularly preferred embodiment, the multi-layered moulding material comprises three layers wherein a central resin layer has a fibrous layer conjoined to either side.

In one alternative arrangement, the multi-layered moulding material comprises five layers in which the two outer layers are dry fibrous layers each attached on its inner

(1) <.....>

5 <Document US-A-4 311 661 describes a process for
producing a resin-fibre composite article with a relatively
low void content. The process comprises the step of forming
an assembly on the surface of a mould, the assembly
comprising individual layers consisting of a resin film, a
10 fibrous reinforcement layer, a porous parting film and a
bleeder layer. The process further comprises the step of
applying a vacuum to the assembly and heating the assembly
to cause the resin film to melt and impregnate upwards from
the mould surface through the reinforcement layer, the
15 porous parting film and into the bleeder layer to
completely saturate both the fibrous reinforcement layer
and the bleeder layer. After the impregnation stage, the
assembly is further heated at a sufficient temperature and
pressure to effect final curing of the resin. After curing,
20 the composite article is retrieved by removing the bleeder
layer and the parting film from the assembly.

A disadvantage of this particular process is that the
resin layer, reinforcement layer and bleeder layer are each
25 laid up separately which is labourious. Also, the process
is unnecessarily complicated because of the requirements of
a bleeder layer and a parting film which need to be
installed and later removed. To achieve a complete wetting
out of both the reinforcement layer and the bleeder layer
30 by upward impregnation, the evacuation time and vacuum
pressure depend on the thickness of the reinforcement
layers in the assembly. For a large thickness of
reinforcement material, the evacuation time can be
substantial. Another problem associated with this material
35 is that it requires handling of a resin film. These films

are either hard, brittle, inflexible materials which do not adapt to the shape of the mould when they are laid up, or these films are soft, tacky and sticky which prevents them from being easily handled and re-positioned in the mould.

5 The form of the film during handling depends on its formulation and temperature. Another problem is that of tailoring of the assembly. In most composite structures the laminate is not uniform. The laminate is normally made thinner in areas of low loads or stresses and reinforced

10 (thicker) in areas of high loads or stresses. This process is called tailoring. In the process of document US-A-4 311 661, tailoring requires adaptation of both the resin film and the reinforcement layers which is labour intensive. If any tailoring has not been achieved correctly (the resin/

15 reinforcement fibre ratio is not optimal in the laminate locally), the structure of the moulded article is impaired.

Document DE-A-35 36 272 relates to a method of fabricating a composite part from a pre-shaped moulding

20 material in a mould. According to this method, the pre-shaped moulding material comprises a layer of a resin material and a layer of a fibrous material. The resin layer is formed in the shape of the mould (pre-shaped) before it is laid up. This is achieved by forming a support film

25 (foil) in the shape of the mould and spraying resin material onto the film. After the resin layer is shaped, dry fibrous material is provided on the resin layer. The pre-shaped moulding material is processed in the mould by applying both pressure (vacuum) and heat.

30

Similar to document US-A-4 311 661, the evacuation time depends on the thickness of the fibrous layers, and consequently, for thick layers of reinforcement material, the evacuation time can be substantial to achieve complete

35 impregnation of the fibrous layers. Other disadvantages of

this method are that during the composition of the moulding material outside the mould, a support film is necessary to support the material. Fabrication according to this method is therefore complicated and inefficient, since it requires
5 an additional pre-shaping step of the material before the material is laid up in the mould.

Both of the afore described methods are impractical and difficult to use in a production environment,
10 particularly in a production environment in which complex moulds and moulds of varying shapes are used. The afore described methods are also complicated and require a lot of expertise and skill from the fabricator.>

with the present invention is interleaved with layers of conventional prepreg 5. This stack is preferably surrounded by a non-perforated film 6, a breather 7 and a vacuum film 8. The vacuum film 8 is sealed to the tooling by means of sealant tape and the air is evacuated during the curing process via vacuum line 10.

5

Curing is preferably effected at temperatures above ambient.

Glass rovings 11 may be utilised to assist the perimeter air bleed. These glass rovings are particularly advantageous where a zero bleed mode of processing is used. The
 10 glass rovings are put through the non-perforated film to assist in the evacuation of air from the laminate stack. To further assist the removal of air, glass rovings may be placed through the non-perforated film in the centre of the panel. These allow air to bleed from the centre of the panel and also connects the moulding materials of the present invention in the laminate together in the z-axis thereby further assisting
 15 evacuation of air.

When making sandwich laminates in one operation it is beneficial to have air bleed holes in the core. These allow the air to escape from the underlying laminate thus preventing any closing off of the material under the foam block. Saw cuts in the
 20 lower face of the core around the perimeter may also be used to eliminate any closing off effects of the core edge. The saw cuts are typically 2mm deep by 1mm wide and end 8cm long at a spacing of every 8cm.

The apparatus illustrated in Figure 3 is very similar to that of Figure 2 but is
 25 appropriate for use with a large laminate stack.

$\langle 1 \text{ Pa.s} \rangle$ $\langle 10 \text{ Pa.s} \rangle$

A suitable cure schedule involves holding the temperature at a point where the resin viscosity is low, for example, $\langle 10 \text{ poise} \rangle$ to $\langle 100 \text{ poise} \rangle$ for a period of 4 hours, and remains low for sufficient time for the resin to wet out the fibres of the fibrous layer
 30 or layers. A typical cure schedule would be to ramp from 25 to 70°C, a dwell at 70°C for four hours, ramp to 85°C and then held at 85°C for 10 hours. On this schedule a typical resin viscosity would drop down to 40 poise and at the end of the four hour

dwel has only risen to (100 poise) The ramp rates to 70 °C or 85 °C are not critical. However, they will normally be in the range of 0.1 to 10 °C/min.

Example 1

5

A prepreg according to the present invention was formed by laying unidirectional E-glass woven reinforcement of 500 g/m² on opposing sides of a layer of 430 g/m² resin. This prepreg was interleaved with layers of conventional prepreg tape of 1200 E-glass with a resin content of 30% by weight. In both types of prepreg the resin used
10 was the SP Systems SE90 available from SP Systems of Structural Polymer (Holdings) Limited of Isle of Wight. The resin is a high flow, 85 to 120°C cure, non-toughened epoxy prepreg cured by an accelerated dicyandiamide curing agent. SE90 prepreg is an epoxy prepreg.

15

The laminate stack was then covered with nylon peel ply and a microperforated release film, a layer of 150g non-woven breather material and an impervious nylon vacuum bag.

20 A vacuum of 90% was applied and the assembly heated from ambient to 70°C at 0.3°C/min. The temperature was then held at 70°C for 4 hours. The temperature was then ramped up to 120°C and then held for one hour. The laminate was then cooled to ambient temperature and the laminate was demoulded and examined.

25 On examination it was noted that the dry reinforcement layers had completely wet out and the laminate was free of entrapped air.

The void content of the laminate was determined by measuring the specific gravity of the sample by weighing it in air and water. The laminate was then put in an oven at
30 650°C to burn off the resin. From the weight loss and the densities of the resin and the glass, the void content was calculated. Measurements showed the void content to be less than 0.25%. The final fibre volume fraction was 56%.

WO 00/27632

PCT/GB99/03667

CLAIMS

<preform>

1. A multi-layered moulding material comprising a layer of resin material and conjoined to at least one surface thereof a fibrous layer $\sqrt{2}$ <--->
2. A multi-layered moulding material according to Claim 1 wherein a first fibrous layer is conjoined to the upper surface of the resin layer and a second fibrous layer is conjoined to the lower surface of the resin layer.
3. A multi-layered moulding material according to Claim 2 wherein the first and second fibrous layers are formed from the same material.
4. A multi-layered moulding material according to Claim 2 wherein the first and second fibrous layers are formed from different materials.
5. A multi-layered moulding material according to any one of Claims 1 to 4 wherein the or each fibrous layer is held in place by the inherent tack of the surface of the resin layer.
6. A multi-layered moulding material according to any one of Claims 1 to 4 wherein the or each fibrous layer is partially impregnated by resin.
7. A multi-layer moulding material according to any one of Claims 1 to 6 wherein a tackifier and/or a binder is applied to one or both outer surfaces of the at least one fibrous layer
8. A multi-layer moulding material according to any one of Claims 1 to 7 wherein the fibrous layer is continuous.
9. A multi-layered moulding material according to any one of Claims 1 to 8 wherein the fibrous layer is discontinuous.
10. A multi-layered moulding material according to any one of Claims 1 to 9 wherein the resin system is a thermosetting polymer

$\sqrt{2}$ <---> = < said moulding material further comprising an air transport structure for allowing entrapped air to pass out of the material during processing of the material. >

WO 00/27632

11. A multi-layered moulding material according to Claim 10 wherein the thermosetting polymer is selected from epoxy, polyester, vinylester, polyimide, cyanate ester, phenolic and bismaleimide systems, modifications thereof and blends thereof.
12. A multi-layered moulding material according to any one of Claims 1 to 11 wherein the or each fibrous layer is formed from glass fibres, carbon fibres, polyethylene fibres, aramid fibres, natural fibres or modified natural fibres.
13. A multi-layered moulding material according to any one of Claims 1 to 12 wherein the fibres in the fibrous layer or layers are unidirectional.
14. A multi-layered moulding material according to any one of Claims 1 to 13 wherein one or more layers of the material is a prepreg.
<fibrous>
15. A multi-layered moulding material according to any one of Claims 1 to 14 wherein the material is a prepreg.
<moulding>
16. A multi-layered moulding material for use in the production of a surface layer comprising a multi-layered moulding material according to any one of Claims 1 to 15.
17. A multi-layered moulding material for use in the production of a surface layer according to Claim 16 in which a woven fibrous layer is conjoined to one surface and a nonwoven fibrous layer is conjoined to the opposing surface.
18. A method of forming a multi-layered material of any one of Claims 1 to 17 by placing the or each fibrous layer in contact with the resin layer.
19. A method according to Claim 18, additionally comprising the step of partly compacting the fibrous layer into the resin layer.
20. An article of manufacture produced from the moulding material of any one of Claims 1 to 17 or made in accordance with any one of Claims 18 to 19.
21. A method of forming the article of manufacturing of Claim 20 in which the moulding material is placed in contact with the mould and allowed to cure.

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference GHS/5937/6	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 99/ 03667	International filing date (day/month/year) 05/11/1999	(Earliest) Priority Date (day/month/year) 06/11/1998
Applicant STRUCTURAL POLYMER SYSTEMS LIMITED et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.
☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1
☐ Non of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/03667

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B32B27/12 C08J5/24 B29C70/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B32B C08J B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 224 064 A (DORNIER GMBH) 3 June 1987 (1987-06-03) the whole document ---	1-3, 8, 12, 18, 20, 21
X	DE 35 36 272 A (MESSERSCHMITT BOELKOW BLOHM) 16 April 1987 (1987-04-16) the whole document ---	1, 5, 8, 10, 15, 18, 20, 21
X	EP 0 807 514 A (UNITED TECHNOLOGIES CORP) 19 November 1997 (1997-11-19) the whole document ---	1, 6, 8, 10, 12, 15, 16, 20, 21

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☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

8 February 2000

Date of mailing of the international search report

18/02/2000

Name and mailing address of the ISA

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Ibarrola Torres, O

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/03667

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 790 432 A (FLETCHER J ET AL) 5 February 1974 (1974-02-05) column 3, line 21 -column 4, line 19 ---	1-3,5,8, 10,12, 15,18, 20,21
X	DE 32 43 925 A (SIEMENS AG) 30 May 1984 (1984-05-30) the whole document ---	1-3,5,8, 10,12, 18,20,21
X	GB 1 248 060 A (IMPERIAL CHEM. IND.) 29 September 1971 (1971-09-29) the whole document ---	1-3,8, 12,18, 20,21
X	US 4 311 661 A (PALMER RAYMOND J) 19 January 1982 (1982-01-19) claims; figure ---	1,5,8, 10-12, 18,20,21
X	US 5 431 995 A (NAKAI KIYOTAKA ET AL) 11 July 1995 (1995-07-11) column 2, line 8 -column 5, line 62; figure 1 -----	1-3,5,8, 10-12, 14,18, 20,21

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 99/03667

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0224064	A	03-06-1987	DE 3542217 A	04-06-1987
DE 3536272	A	16-04-1987	NONE	
EP 0807514	A	19-11-1997	US 5786285 A	28-07-1998
			JP 10067013 A	10-03-1998
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			DE 1963563 A	02-07-1970
			FR 2026433 A	18-10-1970
			NL 6918875 A	22-06-1970
US 4311661	A	19-01-1982	NONE	
US 5431995	A	11-07-1995	JP 5318471 A	03-12-1993

INTERNATIONAL SEARCH REPORT

International application No.

PCT/GB 99/ 03667

B x III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

Line 1: after "material" insert (1),
Line 1: after "layer" insert "(2)"
Line 2: after "layer" insert "(3,4)."
Line 3: after "material" insert "(1)".